

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered). Please AMEND claims * and ADD new claims * in accordance with the following:

1. (currently amended) A pattern segmentation apparatus, comprising:
a feature amount extraction unit extracting a feature amount of an image;
a feature amount setting unit setting a feature amount of a category;
a feature amount comparison unit comparing the feature amount of the category with the feature amount of the image; and
a segmentation unit segmenting an area similar to the feature amount of the category from the image based on the comparison result;

wherein a pattern corresponding to a feature amount of a category at a location of an image is segmented, images are segmented at a position between said images when a touching position between said images does not correspond to a minimum point of a black pixel projection histogram and when an image has a number of uneven portions in a pattern to be segmented, one pattern can be prevented from being divided into a large number of areas at the minimum point of the pattern, by collectively segmenting a portion corresponding to a feature amount of a category from an image.

2. (previously presented) The apparatus according to claim 1, wherein
said feature amount comparison unit comprises a correspondence generation unit generating correspondence relationships between the feature amount of the category and the feature amount of the image, and compares the feature amount of the category with the feature amount of the image based on the correspondence relationships.

3. (previously presented) The apparatus according to claim 2, wherein said feature amount comparison unit comprises:
a difference level computation unit computing a difference in level between the feature amount of the category and the feature amount of the image, which are related by the correspondence relationships; and

an optimum correspondence extraction unit extracting optimum correspondence relationships each of which indicating a lowest difference level from the correspondence relationships, wherein

said segmentation unit segments an area corresponding to positions in which the difference level of the optimum correspondence relationship is equal to or lower than a predetermined value from the image.

4. (previously presented) The apparatus according to claim 3, further comprising:
a combination unit generating a combination of segmentation areas that are segmented from the image in such a way that areas similar to a feature amount of any categories may be adjacently connected to each other on the image; and

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a segmentation area determination unit determining a segmentation area of the image by prioritizing a combination in which a value obtained by accumulating each difference level for the corresponding category in each segmentation area of the combination of segmentation area is the smaller of the combinations.

5. (currently amended) A pattern segmentation apparatus, comprising:
a feature amount extraction unit extracting a feature amount of a character string image as a sequence of elements in a character string array direction;

a feature amount setting unit setting a feature amount of a category as a sequence of elements in a category array direction; and

~~a relating unit relating a last element of the sequence of the elements of the category to each of the sequence of elements of the character string image and relating each element linked to the last of the sequence of elements of the category to the element related to the last of the sequence of elements of the category or any element linked to the element related to the last of the sequence of elements of the category;~~

a correspondence unit corresponding a last element in the sequence of the elements of the category with each element of the character string image;

a search unit searching for an element of the character string image relating to the first element of the sequence of elements of the category in each of the sequence of elements of the image, to which the last of the sequence of elements of the category is related;

a difference level computation unit computing a difference level in a feature amount between the character string image and the category, whose sequence of elements are related to each other; and

a discrimination unit discriminating a segmentation position of a character from the character string image based on the difference level; and

wherein the first and the last elements of the feature amount set as an element sequence of a category in the array direction are independently moved in the character string array direction to allow the feature amount of the category to correspond to the feature amount of the character string image.

6. (original) The apparatus according to claim 5, wherein
said difference level is obtained from an accumulation result of a distance between elements from the first element to the last element in the sequence of the elements of the category.

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COR → 7. (previously presented) The apparatus according to claim 6, wherein
said search unit makes a correspondence relationship of a current element in the correspondence relationship of past elements based on the correspondence relationship indicating the smallest accumulation value of the distance between elements.

8. (previously presented) The apparatus according to claim 5, further comprising:
an entry unit entering a set of a searched element of the character string image that is related to the first element of the sequence of elements of the category and a corresponding difference level for each category to be recognized, for each of the sequence of elements of the image which is related to the last of the sequence of elements of the category;

a search unit searching for a difference level whose value is equal to or smaller than a predetermined value of difference levels specified by an element corresponding to the segmentation position of the character string image;

an acquisition unit obtaining the element of the character string image corresponding to the difference level searched for by said search unit, from said entry unit; and

a computation unit computing a subsequent segmentation position of the character string image based on the element of the character string image obtained by said entry unit.

9. (currently amended) A pattern segmentation apparatus. ~~The apparatus according to claim 8, further comprising:~~

a feature amount extraction unit extracting a feature amount of a character string image as a sequence of elements in a character string array direction;

a feature amount setting unit setting a feature amount of a category as a sequence of elements in a category array direction and relating a last element of the sequence of the elements of the category to each of the sequence of elements of the character string image and relating each element linked to the last of the sequence of elements of the category to the element related to the last of the sequence of elements of the category or any element linked to the element related to the last of the sequence of elements of the category;

a search unit searching for an element of the character string image relating to the first element of the sequence of elements of the category in each of the sequence of elements of the image, to which the last of the sequence of elements of the category is related;

a difference level computation unit computing a difference level in a feature amount between the character string image and the category, whose sequence of elements are related to each other;

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CON- a discrimination unit discriminating a segmentation position of a character from the character string image based on the difference level;

an entry unit entering a set of a searched element of the character string image that is related to the first element of the sequence of elements of the category and a corresponding difference level for each category to be recognized, for each of the sequence of elements of the image which is related to the last of the sequence of elements of the category;

a search unit searching for a difference level whose value is equal to or smaller than a predetermined value of difference levels specified by an element corresponding to the segmentation position of the character string image;

an acquisition unit obtaining the element of the character string image corresponding to the difference level searched for by said search unit, from said entry unit;

a computation unit computing a subsequent segmentation position of the character string image based on the element of the character string image obtained by said entry unit

a path generation unit generating a path connecting the segmentation position of the character string image with the next segmentation position of the character string image computed by said computation unit;

an attribute assignment unit assigning a coordinate of the segmentation position, the difference level searched for by said search unit, and

the category corresponding to the difference level as attributes of the path;

a combination generation unit generating a combination of the paths by trading the character string image through the path;

an evaluation unit evaluating the combination of the paths based on an accumulation

result of a difference level assigned to the path;

a selection unit selecting a combination of the paths based on the evaluation result; and

a section point determination unit determining a coordinate assigned to a path selected by said selection unit as a section point of the character string image.

10. (previously presented) The apparatus according to claim 9, further comprising a recognition result output unit determining a category assigned to a path selected by said selection unit as a recognition result of an area in the character string image segmented in the segmentation position.

11. (currently amended) A method of segmenting a pattern, comprising:
setting a feature amount of a category;
extracting a feature amount of the an image;
generating an arbitrary correspondence relationship between the feature amount of the category and the feature of the image;

comparing the feature amount of the category with the feature amount of the image based on the correspondence relationship; and

segmenting an area similar to the feature amount of the category from the image based on the comparison result; and

wherein a pattern corresponding to a feature amount of a category at a location of an image is segmented, images are segmented at a position between said images when a touching position between said images does not correspond to a minimum point of a black pixel projection histogram, and when an image has a number of uneven portions in a pattern to be segmented, one pattern can be prevented from being divided into a large number of areas at the minimum point of the pattern, by collectively segmenting a portion corresponding to a feature amount of a category from an image.

12. (original) The method according to claim 11, wherein said feature amount of the category is compared with the entire feature amount of the image in a continuous DP method.

13. (original) The method according to claim 11, wherein said feature amount is peripheral features up to an n-th ($n \geq 1$) peripheral feature.

14. (previously presented) The method according to claim 11, wherein:

of all combinations of segmentation positions in which segment areas similar to a feature amount of any of the categories in such a way as to being adjacently connected on the image, a combination whose sum of a difference level between the image segmented in each segmentation position and the category similar to the image is a minimum is selected.

15. (currently amended) A method of segmenting a pattern, comprising:

segmenting a first segmentation area corresponding to a feature amount of a category from an image where when a pattern corresponding to a feature amount of a category at a location of an image is segmented, images are segmented at a position between said images when a touching position between said images does not correspond to a minimum point of a black pixel projection histogram and when an image has a number of uneven portions in a pattern to be segmented, one pattern can be prevented from being divided into a large number of areas at the minimum point of the pattern, by collectively segmenting a portion corresponding to a feature amount of a category from an image; and

changing the first segmentation area when a second segmentation area cannot be segmented corresponding to a feature amount of a category from remaining areas of the image.

16. (currently amended) A character segmenting method, comprising:

extracting a feature amount of a character string image as a sequence of elements in a character string array direction;

setting a feature amount of a category as a sequence of elements in a category array direction;

scanning first and last elements of the sequence of elements of the category independently of the sequence of the elements of the character string image to allow the feature amount of the category to correspond to the feature amount of the character string image;

computing a correspondence relationship between the sequence of the elements of the category and the sequence of elements of the character string image based on the scanning;

computing a difference level in a feature amount between the character string image and the category, which are related to each other by the correspondence relationship; and

determining in what area of the character string image a feature amount similar to the feature amount of the category exists, based on the difference level; and

wherein the first and the last elements of the feature amount set as an element sequence of a category in the array direction are independently moved in the character string array

direction to allow the feature amount of the category to correspond to the feature amount of the character string image.

17. (currently amended) A pattern recognizing method, comprising:
setting a feature amount of a category;
extracting a feature amount of an image;
generating an arbitrary correspondence relationship between the feature amount of the category and the feature amount of the image;
comparing the feature amount of the category with the feature amount of the image based on the correspondence relationship;
segmenting an area similar to the feature amount of the category from the image based on the comparison result; and
determining the category used for the segmentation as a recognition result of the area segmented from the image; and
wherein a pattern corresponding to a feature amount of a category at a location of an image is segmented, images are segmented at a position between said images when a touching position between said images does not correspond to a minimum point of a black pixel projection histogram, and when an image has a number of uneven portions in a pattern to be segmented, one pattern can be prevented from being divided into a large number of areas at the minimum point of the pattern, by collectively segmenting a portion corresponding to a feature amount of a category from an image.

18. (withdrawn) A pattern recognizing method, comprising
setting a feature amount for segmenting a category;
setting a feature amount for recognition of a category;
segmenting a pattern from an image based on the feature amount for segmentation; and
recognizing a pattern segmented from the image based on the feature amount for recognition.

19. (currently amended) A computer-readable storage medium storing a program for executing at least:
setting a feature amount of a category;
extracting a feature amount of an image;
generating an arbitrary correspondence relationship between the feature amount of the

category and the feature amount of the image;

comparing the feature amount of the category with the feature amount of the image based on the correspondence relationship; and

segmenting an area similar to the feature amount of the category from the image based on the comparison result; and

wherein a pattern corresponding to a feature amount of a category at a location of an image is segmented, images are segmented at a position between said images when a touching position between said images does not correspond to a minimum point of a black pixel projection histogram; and when an image has a number of uneven portions in a pattern to be segmented, one pattern can be prevented from being divided into a large number of areas at the minimum point of the pattern, by collectively segmenting a portion corresponding to a feature amount of a category from an image.

20. (currently amended) A pattern segmentation apparatus, comprising:

feature amount extraction means for extracting a feature amount of an image;

feature amount setting means for setting a feature amount of a category;

feature amount comparison means for comparing the feature amount of the category with the feature amount of the image; and

segmentation means for segmenting a portion corresponding to the feature amount of the category from the image based on the comparison result; and

wherein a pattern corresponding to a feature amount of a category at a location of an image is segmented, images are segmented at a position between said images when a touching position between said images does not correspond to a minimum point of a black pixel projection histogram, and when an image has a number of uneven portions in a pattern to be segmented, one pattern can be prevented from being divided into a large number of areas at the minimum point of the pattern, by collectively segmenting a portion corresponding to a feature amount of a category from an image.

21. (currently amended) A pattern segmentation apparatus, comprising:

feature amount extraction means for extracting a feature amount of a character string image as a sequence of elements in a character string array direction;

feature amount setting means for setting a feature amount of a category as a sequence of elements in a category array direction; and

~~relating means for relating a last element of the sequence of the elements of the~~

~~category to each of the sequence of elements of the character string image, and relating each element linked to the last of the sequence of elements of the category to the element related to the last of the sequence of elements of the category or any element linked to the element related to the last of the sequence of elements of the category;~~

a correspondence unit corresponding a last element in the sequence of the elements of the category with each element of the character string image;

search means for searching for an element of the character string image related to a first of the sequence of the elements of the category in each of the sequence of elements of the image to which the last of the sequence of elements of the category is related;

difference level computation means for computing a difference level in a feature amount between the character string image and the category whose sequence of elements are related to each other; and

discrimination means for discriminating a segmentation position of a character from the character string image based on the difference level; and

wherein the first and the last elements of the feature amount set as an element sequence of a category in the array direction are independently moved in the character string array direction to allow the feature amount of the category to correspond to the feature amount of the character string image.

22. (previously presented) An pattern segmentation apparatus, comprising:

a feature amount extraction unit extracting a feature amount of a character string image as a sequence of elements in a character string array direction;

a feature amount setting unit setting a feature amount of a category in a category array direction;

a correspondence unit corresponding a last element in the sequence of the elements of the category with each element of the character string image;

a search unit searching for an element of the character string image relating to a first element of the sequence of elements of the category in each of the sequence of elements of the image to which the last of the sequence of the elements of the category is related;

a difference level computation unit computing a difference level between the character string image and the category corresponding to each other in the sequence of the elements;

a discrimination unit discriminating a segmentation position of a character from the character string image based on the difference level;

an entry unit entering a set of an element of the character string image corresponding to

the first element of the sequence of the elements of the category and a corresponding difference level for all elements in the character string image array direction;

a search unit detecting a difference level indicating a value equal to or smaller than a predetermined value in difference levels specified by each element corresponding to the segmentation position of the character string image;

an obtaining unit obtaining the element of the character string image corresponding to the difference level retrieved by said search unit from said entry unit;

a computation unit computing a next segmentation position of the character string image based on the element of the character string image obtained from said entry unit;

a path generation unit generating a path connecting the segmentation position of the character string image with the next segmentation position of the character string image computed by said computation unit;

an attribute assignment unit assigning a coordinate of the segmentation position, the difference level searched for by said search unit, and

the category corresponding to the difference level as attributes of the path;

a combination generation unit generating a combination of the paths by trading the character string image through the path;

an evaluation unit evaluating the combination of the paths based on an accumulation result of a difference level assigned to the path;

a selection unit selecting a combination of the paths based on the evaluation result; and

a section point determination unit determining a coordinate assigned to a path selected by said selection unit as a section point of the character string image.

23. (previously presented) The apparatus according to claim 22, further comprising a recognition result output unit defining a category assigned to a path selected by said selection unit as a recognition result of a pattern sectioned at the section point.

24. (currently amended) A pattern segmentation process, comprising:
storing a character feature size for features to be extracted from a character string image;

scanning the character string image and extracting a image feature sizes of features in the character string image;

comparing the character feature sizes to the image feature sizes and determining best matches between character feature sizes and image feature sizes; and

segmenting the charter string image based on the best matches; and
wherein a pattern corresponding to a feature amount of a category at a location of an
image is segmented, images are segmented at a position between said images when a touching
position between said images does not correspond to a minimum point of a black pixel
projection histogram, and when an image has a number of uneven portions in a pattern to be
segmented, one pattern can be prevented from being divided into a large number of areas at the
minimum point of the pattern, by collectively segmenting a portion corresponding to a feature
amount of a category from an image.

25. (new) A pattern segmentation process, comprising:
storing a number of pixels character feature size for features to be extracted from a
character string image;
scanning the character string image and extracting a number of pixels image feature
sizes of features in the character string image;
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CDL-4 comparing the number of pixels character feature sizes to the image feature sizes and
determining best matches between character feature sizes and image feature sizes; and
segmenting the charter string image based on the best matches.

26. (new) A pattern segmentation process, comprising:
storing a character feature physical size for features to be extracted from a character
string image;
scanning the character string image and extracting image feature physical sizes of
features in the character string image;
comparing the character feature physical sizes to the image feature physical sizes and
determining best matches between character feature physical sizes and image feature physical
sizes; and
segmenting the charter string image based on the best matches.
